Amendment to the Claims:

The listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1-10 (Previously Cancelled)

11. (Currently Amended) A method of determining a thermal profile of a drilling fluid circulating in a well during drilling, comprising the steps:

a) determining an expression $\theta 1$ of a thermal profile of the drilling fluid inside the drill string in the well and a expression $\theta 2$ of a thermal profile of the drilling fluid in an ~~surrounding~~ annulus surrounding the drill string, using a heat propagation equation accounting for a thermal profile of a medium surrounding the well;

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b) measuring a temperature T1 of the drilling fluid at a well inlet ~~T1~~, a temperature T2 at a bottom of the well ~~T2~~, and a temperature T3 at a well outlet ~~T3~~; and wherein

c) the expressions $\theta 1$ and $\theta 2$ meet temperature boundary conditions of T1, T2 and T3.

12. (Previously Added) A method as claimed in claim 11 comprising, after step c):

d) providing a drilling fluid having a thermal profile which is a function of the depth.

13. (Previously Added) A method as claimed in claim 11 wherein:

repeating steps b), c) and d) to obtain a real-time temperature profile.

14. (Currently Amended) A method as claimed in claim 11, wherein:

in step a), expressions $\theta 1$ and $\theta 2$ comprise unknown constants[,]; and

in step c), expressions $\theta 1$ and $\theta 2$ are made to meet the boundary temperature conditions T1, T2 and T3 by determining the unknown constants.

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15. (Previously Added) A method as claimed in claim 11 wherein:

in step a) a heat propagation equation accounting for at least a thermal equation of the medium surrounding the well, a flow rate of the drilling fluid and a balance of thermal exchanges undergone by the drilling fluid are used and the thermal exchanges comprise at least exchanges between ascending and descending drilling fluid.

16. (Currently Amended) A method as claimed in claim 11, wherein:

in step a) a heat propagation equation in ~~a homogeneous~~ the medium which is homogeneous on a cylinder of infinite height centered on the well is used, the cylinder comprising the drill string that guides descending drilling fluid and an annulus surrounding the drill string which guides ascending drilling fluid.

17. (Previously Added) A method as claimed in claim 11 wherein:

in step a) expressions $\theta 1$ and $\theta 2$ are each split into independent equations; and

in step c) the thermal profiles and derivatives of the thermal profiles of the fluid within the drill string and in the surrounding annulus are continuous.

18. (Currently Amended) A method as claimed in claim 11, applied to a vertical offshore well wherein:

in step a) each expression $\theta 1$ and $\theta 2$ are split into independent equations by accounting for a thermal profile of ~~a~~ the medium surrounding the well; and

in step c) the thermal profiles and derivatives of the thermal profiles of the drilling fluid within the drill string and in the ~~surrounding~~ annulus surrounding the drill string are continuous.

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19. (Previously Added) A use of the method as claimed in claim 11, wherein:

calculation of pressure drops of the drilling fluid circulating in the well during drilling are made.

20. (Previously Added) A use of the method as claimed in claim 11, wherein:

calculation of hydrate formation zones in the drilling fluid during drilling are made.

21. (New) A method as claimed in claim 12 wherein:

repeating steps b), c) and d) to obtain a real-time temperature profile.

22. (New) A method as claimed in claim 12, wherein:

in step a), expressions $\theta 1$ and $\theta 2$ comprise unknown constants; and

in step c), expressions $\theta 1$ and $\theta 2$ are made to meet the boundary temperature conditions T1, T2 and T3 by determining the unknown constants.

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23. (New) A method as claimed in claim 13, wherein:

in step a), expressions $\theta 1$ and $\theta 2$ comprise unknown constants; and

in step c), expressions $\theta 1$ and $\theta 2$ are made to meet the boundary temperature conditions T1, T2 and T3 by determining the unknown constants.

24. (New) A method as claimed in claim 21, wherein:

in step a), expressions $\theta 1$ and $\theta 2$ comprise unknown constants; and

in step c), expressions $\theta 1$ and $\theta 2$ are made to meet the boundary temperature conditions T1, T2 and T3 by determining the unknown constants.

25. (New) A method as claimed in claim 12 wherein:

in step a) a heat propagation equation accounting for at least a thermal equation of the medium surrounding the well, a flow rate of the drilling fluid and a balance of thermal exchanges undergone by the drilling fluid are used and the

thermal exchanges comprise at least exchanges between ascending and descending drilling fluid.

26. (New) A method as claimed in claim 13 wherein:

in step a) a heat propagation equation accounting for at least a thermal equation of the medium surrounding the well, a flow rate of the drilling fluid and a balance of thermal exchanges undergone by the drilling fluid are used and the thermal exchanges comprise at least exchanges between ascending and descending drilling fluid.

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27. (New) A method as claimed in claim 14 wherein:

in step a) a heat propagation equation accounting for at least a thermal equation of the medium surrounding the well, a flow rate of the drilling fluid and a balance of thermal exchanges undergone by the drilling fluid are used and the thermal exchanges comprise at least exchanges between ascending and descending drilling fluid.

28. (New) A method as claimed in claim 21 wherein:

in step a) a heat propagation equation accounting for at least a thermal equation of the medium surrounding the well, a flow rate of the drilling fluid and a balance of thermal exchanges undergone by the drilling fluid are used and the thermal exchanges comprise at least exchanges between ascending and descending drilling fluid.

29. (New) A method as claimed in claim 22 wherein:

in step a) a heat propagation equation accounting for at least a thermal equation of the medium surrounding the well, a flow rate of the drilling fluid and a balance of thermal exchanges undergone by the drilling fluid are used and the thermal exchanges comprise at least exchanges between ascending and descending drilling fluid.

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30. (New) A method as claimed in claim 12, wherein:

in step a) a heat propagation equation in the medium which is homogeneous on a cylinder of infinite height centered on the well is used, the cylinder comprising the drill string that guides descending drilling fluid and an annulus surrounding the drill string which guides ascending drilling fluid.

31. (New) A method as claimed in claim 13, wherein:

in step a) a heat propagation equation in the medium which is homogeneous on a cylinder of infinite height centered on the well is used, the cylinder comprising the drill string that guides descending drilling fluid and an annulus surrounding the drill string which guides ascending drilling fluid.

32. (New) A method as claimed in claim 14, wherein:

in step a) a heat propagation equation in the medium which is homogeneous on a cylinder of infinite height centered on the well is used, the cylinder comprising the drill string that guides descending drilling fluid and an annulus surrounding the drill string which guides ascending drilling fluid.

33. (New) A method as claimed in claim 15, wherein:

in step a) a heat propagation equation in the medium which is homogeneous on a cylinder of infinite height centered on the well is used, the cylinder comprising the drill string that guides descending drilling fluid and an annulus surrounding the drill string which guides ascending drilling fluid.

34. (New) A method as claimed in claim 21, wherein:

in step a) a heat propagation equation in the medium which is homogeneous on a cylinder of infinite height centered on the well is used, the cylinder comprising the drill string that guides descending drilling fluid and an annulus surrounding the drill string which guides ascending drilling fluid.

35. (New) A method as claimed in claim 22, wherein:

in step a) a heat propagation equation in the medium which is homogeneous on a cylinder of infinite height centered on the well is used, the cylinder comprising the drill string that guides descending drilling fluid and an annulus surrounding the drill string which guides ascending drilling fluid.

36. (New) A method as claimed in claim 25, wherein:

in step a) a heat propagation equation in the medium which is homogeneous on a cylinder of infinite height centered on the well is used, the cylinder comprising the drill string that guides descending drilling fluid and an annulus surrounding the drill string which guides ascending drilling fluid.

37. (New) A method as claimed in claim 12 wherein:

in step a) expressions $\theta 1$ and $\theta 2$ are each split into independent equations; and

in step c) the thermal profiles and derivatives of the thermal profiles of the fluid within the drill string and in the annulus surrounding the drill string are continuous.

38. (New) A method as claimed in claim 13 wherein:

in step a) expressions $\theta 1$ and $\theta 2$ are each split into independent equations; and

in step c) the thermal profiles and derivatives of the thermal profiles of the fluid within the drill string and in the annulus surrounding the drill string are continuous.

39. (New) A method as claimed in claim 14 wherein:

in step a) expressions $\theta 1$ and $\theta 2$ are each split into independent equations; and

in step c) the thermal profiles and derivatives of the thermal profiles of the fluid within the drill string and in the annulus surrounding the drill string are continuous.

40. (New) A method as claimed in claim 15 wherein:

in step a) expressions $\theta 1$ and $\theta 2$ are each split into independent equations; and

in step c) the thermal profiles and derivatives of the thermal profiles of the fluid within the drill string and in the annulus surrounding the drill string are continuous.

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41. (New) A method as claimed in claim 16 wherein:

in step a) expressions $\theta 1$ and $\theta 2$ are each split into independent equations; and

in step c) the thermal profiles and derivatives of the thermal profiles of the fluid within the drill string and in the annulus surrounding the drill string are continuous.

42. (New) A method as claimed in claim 17, applied to a vertical offshore well wherein:

in step a) each expression $\theta 1$ and $\theta 2$ are split into independent equations by accounting for a thermal profile of the medium surrounding the well; and

in step c) the thermal profiles and derivatives of the thermal profiles of the drilling fluid within the drill string and in the annulus surrounding the drill string are continuous.

43. (New) A method as claimed in claim 18, applied to a vertical offshore well wherein:

in step a) each expression $\theta 1$ and $\theta 2$ are split into independent equations by accounting for a thermal profile of the medium surrounding the well; and

in step c) the thermal profiles and derivatives of the thermal profiles of the drilling fluid within the drill string and in the annulus surrounding the drill string are continuous.

44. (New) A method as claimed in claim 19, applied to a vertical offshore well wherein:

in step a) each expression $\theta 1$ and $\theta 2$ are split into independent equations by accounting for a thermal profile of the medium surrounding the well; and

in step c) the thermal profiles and derivatives of the thermal profiles of the drilling fluid within the drill string and in the annulus surrounding the drill string are continuous.

45. (New) A method as claimed in claim 22, applied to a vertical offshore well wherein:

in step a) each expression $\theta 1$ and $\theta 2$ are split into independent equations by accounting for a thermal profile of the medium surrounding the well; and

in step c) the thermal profiles and derivatives of the thermal profiles of the drilling fluid within the drill string and in the annulus surrounding the drill string are continuous.

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46. (New) A method as claimed in claim 25, applied to a vertical offshore well wherein:

in step a) each expression $\theta 1$ and $\theta 2$ are split into independent equations by accounting for a thermal profile of the medium surrounding the well; and

in step c) the thermal profiles and derivatives of the thermal profiles of the drilling fluid within the drill string and in the annulus surrounding the drill string are continuous.